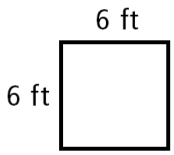
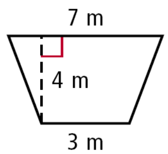
<u>Attendance Problems</u>. Find the area of each figure.

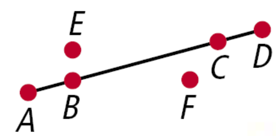
1.



2.



3. 3 points in the figure are chosen randomly. What is the probability that they are collinear?



- I can calculate geometric probabilities.
- I can use geometric probability to predict results in real-world situations.

Vocabulary: Geometric Probability

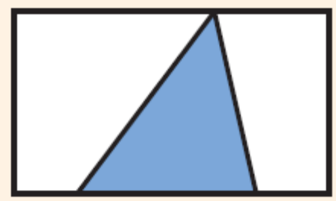
<u>Common Core</u>: <u>CC.9-12.S.CP.1</u> Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).

Vocabulary: geometric probability

4. What is theoretical probability?

5. What is the sample space?

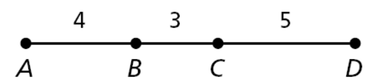
6. What is geometric probability?

Geometric Probability			
Model	**Length**	**Angle Measure**	**Area**
Example			
Sample space	All points on $\overline{AD}$	All points in the circle	All points in the rectangle
Event	All points on $\overline{BC}$	All points in the shaded region	All points in the triangle
Probability	$P = \frac{BC}{AD}$	$P = \frac{\text{measure of angle}}{360^\circ}$	$P = \frac{\text{area of triangle}}{\text{area of rectangle}}$

Remember!

If an event has a probability p of occurring, the probability of the event *not* occurring is $1 - p$.

<u>Video Example 1</u>: A point is chosen randomly on $\overline{AD}$. Find the probability of each event.



A) The point is on $\overline{BD}$.

B) The point is **<u>not</u>** on $\overline{CD}$.

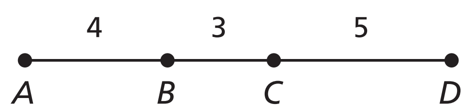
C) The point is on $\overline{AB}$ or $\overrightarrow{CD}$.

1 Using Length to Find Geometric Probability

A point is chosen randomly on $\overline{AD}$. Find the probability of each event.

A **The point is on $\overline{AC}$.**

$$P = \frac{AC}{AD} = \frac{7}{12}$$



B **The point is not on $\overline{AB}$.**

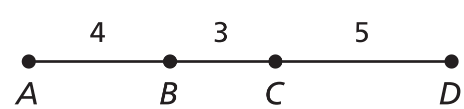
First find the probability that the point is on $\overline{AB}$.

$$P(\overline{AB}) = \frac{AB}{AD} = \frac{4}{12} = \frac{1}{3}$$

Subtract from 1 to find the probability that the point is not on $\overline{AB}$.

$$P(\text{not on } \overline{AB}) = 1 - \frac{1}{3} = \frac{2}{3}$$

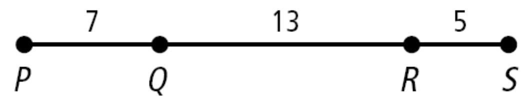
A point is chosen randomly on $\overline{AD}$. Find the probability of each event.



C **The point is on $\overline{AB}$ or $\overline{CD}$.**

$$P(\overline{AB} \text{ or } \overline{CD}) = P(\overline{AB}) + P(\overline{CD}) = \frac{4}{12} + \frac{5}{12} = \frac{9}{12} = \frac{3}{4}$$

<u>Example 1</u>. A point is chosen randomly on $\overline{PS}$. **Find the probability of each event.**

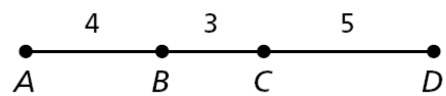


A. The point is on $\overline{RS}$.

B. The point is not on $\overline{QR}$.

C. The length is on on $\overline{PQ}$ or $\overline{QR}$.

7. <u>Guided Practice</u>. Use the figure to find the probability that the point is on $\overline{BD}$.



<u>Video Example 2</u>: A stoplight has the following cycle: green for 45 seconds, yellow for 5 seconds, and red for 1 minute.

A) What is the probability that light will be red when you arrive?

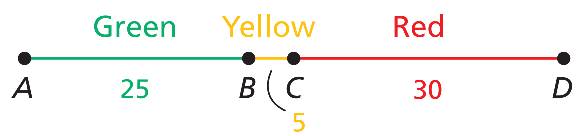
B) If you arrive at the light 80 times, predict how many times you will have to stop and wait more than 5 seconds.

2 Transportation Application

A stoplight has the following cycle: green for 25 seconds, yellow for 5 seconds, and red for 30 seconds.

A What is the probability that the light will be yellow when you arrive?

To find the probability, draw a segment to represent the number of seconds that each color light is on.



$P = \frac{5}{60} = \frac{1}{12} \approx 0.08$ *The light is yellow for 5 out of every 60 seconds.*

B If you arrive at the light 50 times, predict about how many times you will have to stop and wait more than 10 seconds.

In the model, the event of stopping and waiting more than 10 seconds is represented by a segment that starts at C and ends 10 units from D. The probability of stopping and waiting more than 10 seconds is $P = \frac{20}{60} = \frac{1}{3}$.

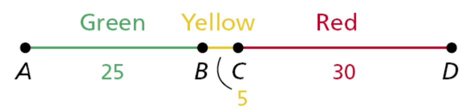
If you arrive at the light 50 times, you will probably stop and wait more than 10 seconds about $\frac{1}{3}(50) \approx 17$ times.

Example 2. A pedestrian signal at a crosswalk has the following cycle: "WALK" for 45 seconds and "DON'T WALK" for 70 seconds.

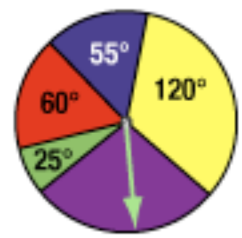
A. What is the probability the signal will show "WALK" when you arrive?

B. If you arrive at the signal 40 times, predict about how many times you will have to stop and wait more than 40 seconds.

5. <u>Guided Practice</u>: Use the information in the diagram. What is the probability that the light will not be on red when you arrive?



<u>Video Example 3</u>: Use the spinner to find the probability of each event.



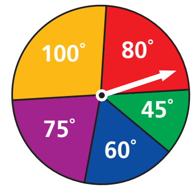
A) What is the probability of the spinner landing on yellow?

B) What is the probability of the spinner landing on blue or green?

C) What is the probability of the spinner landing not landing on purple?

3 Using Angle Measures to Find Geometric Probability

Use the spinner to find the probability of each event.



A **the pointer landing on red**

$$P = \frac{80}{360} = \frac{2}{9}$$

The angle measure in the red region is 80°.

B **the pointer landing on purple or blue**

$$P = \frac{75 + 60}{360} = \frac{135}{360} = \frac{3}{8}$$

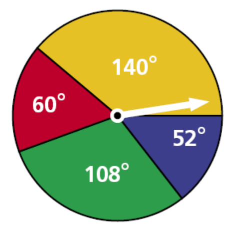
The angle measure in the purple region is 75°. The angle measure in the blue region is 60°.

C **the pointer not landing on yellow**

$$P = \frac{360 - 100}{360} = \frac{260}{360} = \frac{13}{18}$$

The angle measure in the yellow region is 100°. Substract this angle measure from 360°.

Example 3. **Use the spinner to find the probability of each event.**

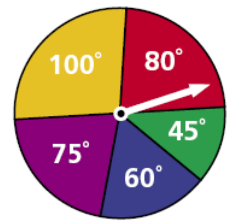


A. The pointer lands on yellow.

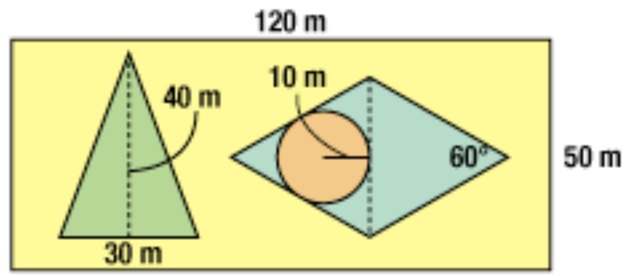
B. The pointer lands on blue or red.

C. The pointer does not land on green.

6. <u>Guided Practice</u>: Find the probability of the pointer landing on red or yellow.



<u>Video Example 4</u>: Find the probability that a point chosen randomly inside the rectangle is in each shape. Round to the nearest hundredth.



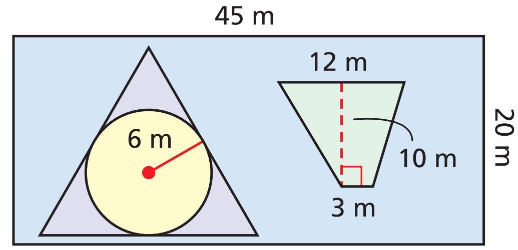
A) The isosceles triangle.

B) The circle

C) The rhombus

4 Using Area to Find Geometric Probability

Find the probability that a point chosen randomly inside the rectangle is in each given shape. Round to the nearest hundredth.



A the equilateral triangle

The area of the triangle is $A = \frac{1}{2}aP$

$$= \frac{1}{2}(6)\left(36\sqrt{3}\right) \approx 187 \text{ m}^2.$$

The area of the rectangle is $A = bh$

$$= 45(20) = 900 \text{ m}^2.$$

The probability is $P = \frac{187}{900} \approx 0.21.$

B the trapezoid

The area of the trapezoid is $A = \frac{1}{2}\left(b_1 + b_2\right)h$

$$= \frac{1}{2}(3 + 12)(10) = 75 \text{ m}^2.$$

The area of the rectangle is $A = bh$

$$= 45(20) = 900 \text{ m}^2.$$

The probability is $P = \frac{75}{900} \approx 0.08.$

C the circle

The area of the circle is $A = \pi r^2$

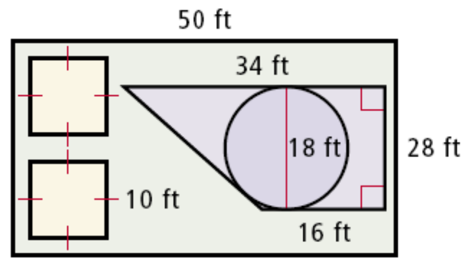
$$= \pi\left(6^2\right) = 36\pi \approx 113.1 \text{ m}^2.$$

The area of the rectangle is $A = bh$

$$= 45(20) = 900 \text{ m}^2.$$

The probability is $P = \frac{113.1}{900} \approx 0.13.$

<u>Example 4</u>. Find the probability that a point chosen randomly inside the rectangle is in each shape. Round to the nearest hundredth.

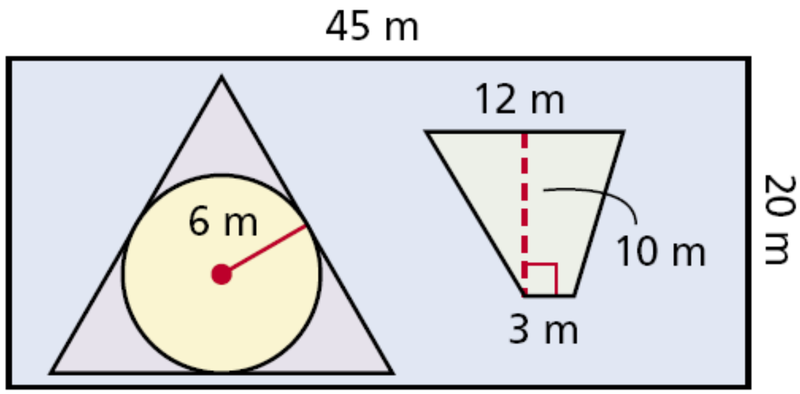


A. The circle.

B. The trapezoid

C. One of the two squares.

7. <u>Guided Practice</u>: Find the probability that a point chosen randomly inside the rectangle is not inside the triangle, circle, or trapezoid. Round to the nearest hundredth.



10-6 Geometric Probability

- *(pp 721)* 17, 19, 21, 22, 23-29 odd, 32-34, 42, 43, 44.
- 10B Ready to Go On pretest & posttests.

Question: 50% of Mr. Grip's desk is covered with student's exams. What is the probability of Mr. Grip spilling coffee on one of them?

Answer: Half-and-half.